Gas Journal

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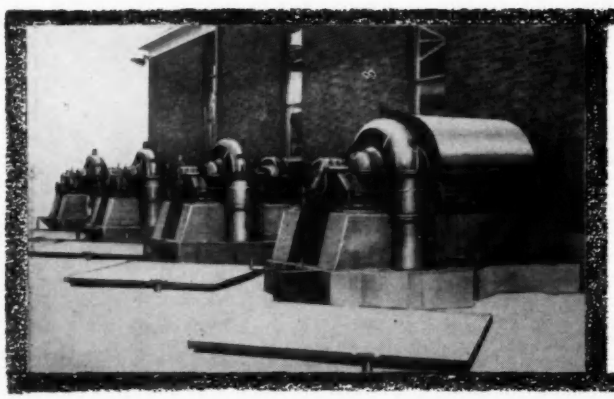

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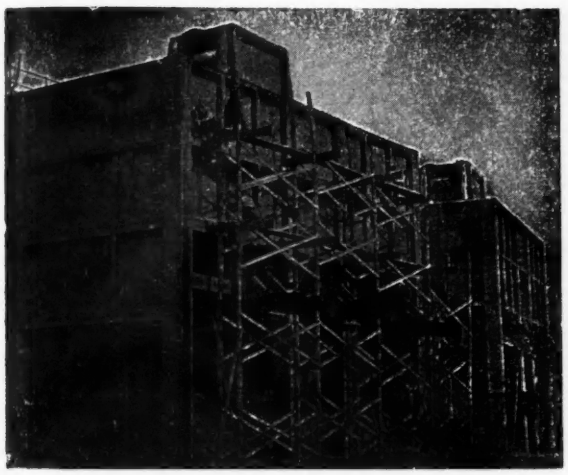

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Gas Journal

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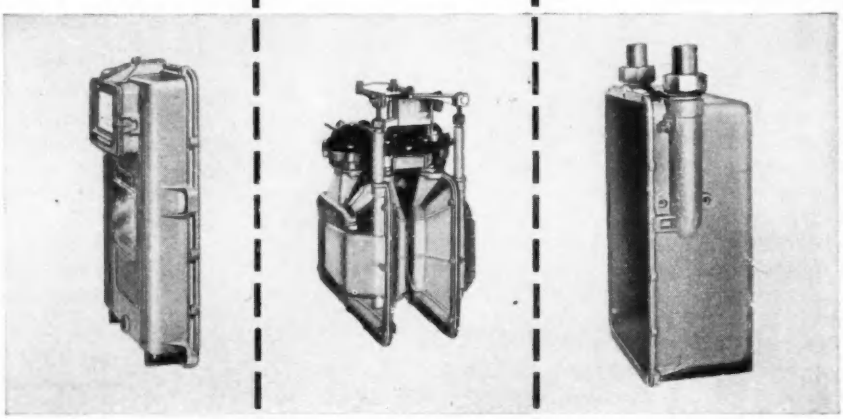

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Gas Journal

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Centralised distribution control

THE operation of a grid system and the possible application of electronics to the gas industry are the subjects of two papers we are publishing this week. At first sight, perhaps, the connection between these two subjects may seem slight but the likelihood of instrumentation becoming increasingly important as an aid to gas production and distribution does much, we think, to narrow any such gap.

Last week we published the first part of the paper on electronics, which dealt with the possible improvement of instrumentation systems by substituting electronic equipment for the more usual pneumatic systems now employed by the industry. Part two, by Mr. J. H. Whitaker, lately of Panellit Ltd., which appears in this week's issue, describes the use and application of a computer working in conjunction with electronic instrumentation and control devices.

As we read the paper on the operation of the grid systems in the East Midlands area by Mr. C. E. Mills, the Board's Assistant Chief Engineer and Production Controller and his colleagues, Mr. A. W. Elliott and Mr. G. H. Potter, Southern and Northern Regional Production Engineers respectively, we realise how very important a reliable means of rigid control of gas production and its distribution is rapidly becoming, especially over so wide an area as the East Midlands Board. Its importance is likely to increase greatly if and when a national grid system and centralised production in the coalfields become a reality.

The East Midlands Board is in some ways fortunate in that it contains in its area three coalfields. In the northern part, there are the South Yorkshire coalfield, with its very important coking plants, the Derbyshire and Nottingham coalfield, which embraces the Avenue coking plant, and further south, the Midlands coalfield where lower rank coals are mined.

The Board has then the best basis for the supply of coal gas from its own plants in addition to surplus coke oven gas taken from coking plants owned by the National Coal Board and others. It is not surprising, therefore, to find a long-established connection between the gas and coking industries in the Sheffield and Rotherham area, where even before nationalisation a very large proportion of town gas was supplied by coke ovens. Such a dependence on an outside source of gas by the old Sheffield Gas Company had its drawbacks, especially when labour difficulties or a depression in the steel industry interfered with coke production. The Board, however, with its wider commitments and its increased opportunities for integrated production, has been able to face such problems with confidence.

South of the Sheffield and Rotherham area—part of the Northern region of the Board—are the remaining sections of the Board's distribution area, including the Southern region. There is no physical connection between these divisions; in fact, they have different declared calorific values. In the south the pattern of demand is different and the area covered is clearly far more extensive. To solve supply problems in an area extending from North Derbyshire to North Buckinghamshire, but excluding Lincolnshire, the ' backbone ' main, the first of its kind to be conceived and constructed since nationalisation, has been laid to convey gas from the present gas-making plants to a fully integrated distribution system. The ' backbone ' extends from Chesterfield to Northampton, connecting these plants with other manufacturing stations at Leicester and Derby, and by branches to plants at Nottingham, Ilkeston and Burton-on-Trent, thus supplying the district distribution systems connected to this fully integrated system.

It is clear that these two regions need their own particular organisation to cope successfully with the varying demands made upon them. In the Northern region, 75% of the load is industrial over a five-day week and the large volumes of gas involved demand that great care must be taken to avoid over-production at the week-end by having the maximum storage capacity available on Friday evenings. The majority of the gas-making plant in this region is static, which makes it possible to start up more quickly retorts which may have been standing under fire for quite long periods during the summer and holiday seasons; the volumes of coke oven gas taken may also be reduced.

In the Southern region the chief sources of base load

gas are the coke oven plants near Chesterfield, at Mansfield and at Stanton. Other carbonising plants in this region consist almost entirely of continuous vertical retorts, and there are also oil-gas and carburetted water gas plants to meet peak demands.

In the much larger area of the southern section, the importance of good communications is at once clear, for without them it would be quite impossible to ensure that gas made in the large centralised works was available in the right place in the right quantity at the right time. Since gas from the coke ovens is not under direct control by the Board, telephone lines connect them with the central control room at Derby to enable attendants to keep in touch; this is in addition to any telemetering equipment there may be for measuring gas flow or holder stocks. All such equipment is connected by telephone lines rented from the G.P.O.; information is logged by the attendants every two hours and calculations are made to arrive at a figure of the volume of gas made, bought or sold within the period.

Any improvement in this system would mean more elaborate communications and this is where the paper on electronics is of concern to gas engineers, since it indicates some of the most up-to-date measuring, telemetering and data processing techniques. It is clear that the application of automation by computer control to gas manufacture in conventional plant is not yet possible. But equipment which will bring information over long distances accurately and, after processing, provide a sheet of typed figures, will allow control room personnel to carry out their main job of exercising proper control without being burdened with a lot of calculations.

The possibility of connecting the two divisions and declaring a uniform calorific value is mentioned by the authors. This, we feel, will call for one centralised control throughout the whole area, with improved communications and better remote control. The present system by telephone wires seems unsatisfactory and we think that the heavy rental cost of lines over increased distances will compel the Board to use wireless. In fact, v.h.f. radio is described as a possibility by the authors.

Is this integration between the two divisions under a central area board control a step towards the supply and exchange of gas between neighbouring boards? It is at least a possibility and if it were to materialise, the best instrumentation systems would be necessary.

Power and prosperity

THE three Cantor lectures, 'The Fuel and Power Industries and National Prosperity,' were recently given by Dr. A. Parker, before the Royal Society of Arts. The third lecture, delivered at the end of February, was devoted to natural and manufactured gas and is therefore of particular interest to our readers.

Natural gas, though associated with the United States and its developments there since the war, has also been discovered in large quantities in Canada as well as in Europe and North Africa, but as is well known, not to any important extent in Great Britain. Discoveries on the Continent in the last 20 years have shown what a revolutionary effect on the fuel industries large quantities of natural gas can have and also what a spur they are to industrial activity. The immense developments in the United States resulting in part from the great activities there in laying long distance pipe-lines have tended to draw away attention from developments in other parts of the world.

For example, one might mention that exploitation of the Sui natural gas deposits in Pakistan in the last few years should have a tremendous effect on the standard of life as well as the industrial activity in that country. Coming nearer home, the discovery and development of natural gas in the Po Valley in Northern Italy has decreased energy and fuel costs to a most remarkable degree. The by-products associated with it, propane and butune, have brought into being there a bottled gas industry which has greatly increased the amenities of the country districts. The most striking discovery in Europe, however, is undoubtedly that near the village of Lacq, in South Western France, near the Pyrenees. This well, some 12,000 ft. deep, is estimated to contain some 5 bill. (10^{12}) cu.ft. at a pressure of about 1,000 p.s.i. The gas from it contains about 15% hydrogen sulphide and 10% carbon dioxide, both of which are absorbed in ethanolamine. The hydrogen sulphide thus recovered is converted to high-grade sulphur. In 1958 the total production at Lacq amounted to 13,850 mill. cu.ft., or about 150 mill. therms of purified gas, 127,000 tons of sulphur, 21,000 tons of petrol and 8,600 tons of l.p. gases. Since then the plant has been greatly enlarged and it is planned by 1961 to produce 150,000 mill. cu.ft. of gas at 1,100 B.t.u. per cu.ft. and 1.3 mill. tons of sulphur as well as greater quantities of other products.

This discovery will clearly have an enormous effect on the energy economy of France and if supplies from the gas and oil fields of Algeria can be economically brought to Europe, the effect on the energy supplies of the whole of Western Europe, including possibly Great Britain, will be immense.

The failure so far to find natural gas in this country in any quantity might indicate a possible disadvantage our industries might be up against in not having a readily available and easily handled low cost fuel. The experiments carried out over last year in bringing liquefied natural gas from the Gulf of Mexico indicate considerable possibilities in the conveying of hitherto unwanted gas from the Middle East oilfields. To be economic the scale of operations would need to be considerably increased.

Dr. Parker goes on to review the production of gas by carbonisation in the metallurgical coke and gas industries in this country. He briefly describes the history of the evolution of the modern coke oven and how in the last 40 years increasing quantities of gas have been supplied to the gas industry. It is interesting to see from the figures he quotes that these have increased by rather more than 50% in the ten years 1948 to 1958. In the same period, too, the volume of gas used by the steel works has risen by about 75% and is only slightly below

that taken by the gas industry. Of the total gas available for distribution by the industry, about 82% is made in gasworks, 16% is bought from the coking industry and the remaining 2% is made up of refinery gas, gas from oil and methane from coal mines.

The production of by-products from coal carbonisation has always been a subject of some interest and Dr. Parker refers to the primary products obtained in this way. In the larger gasworks and in many coke oven works tar is distilled and its main products disposed of, and crude benzole recovered from the gas is rectified and worked up into saleable grades in a high state of purity. But it has not been found economic to establish any substantial industry in which organic chemicals are the main products from large quantities of coal as raw material. This has been attempted on the Continent, especially in Germany, where coal hydrogenation to obtain petrol and the Fischer-Tropsch process for synthesising oils and chemicals were developed. Neither were economic, being largely used for strategic purposes during the last war. It is even doubtful whether the new Fischer-Tropsch plant operating in South Africa and built at a cost of £35 to 40 mill. is really a commercial proposition.

Commentary on the News

Getting the best brains

IT is not always appreciated by those outside gas circles that one of the biggest problems facing the industry is recruitment. Difficulties associated with attracting the right men may be found at most levels in the industry, but nowhere is the problem more acute than at the top. The development of new methods of manufacture and the use of new raw materials for gasmaking makes its future an interesting prospect for those working in it. But it also means that the industry needs to recruit the best brains for positions in management and in control of the many and varied technical and engineering processes.

To show public schoolboys the opportunities for careers in the gas industry, the Gas Council, in collaboration with the Public Schools Appointments Bureau, organises annually 'short works courses,' the fourth of which will be held in April of this year. This course, lasting from April 4-8, has been arranged in co-operation with four of the area Gas Boards—the Eastern, North Thames, South Eastern and Southern—and will give a brief insight into the range of activities within the industry. The course will include a series of visits to plants, works and offices in London and parts of south eastern and southern England.

As we see it the problem has two facets. In the first place, one must successfully convince young men that this is an industry with a future; and secondly, the industry must be able to compete salary-wise with the best that is being offered by the giants of private enterprise.

Unspecified criticism

THE future of the gas industry has always been the subject of a great deal of written conjecture. Born in controversy, it is still subject to the flamboyant attentions of those who see either 'no future' or a 'great future' for this steadily progressive industry. Reasoned comment is at a premium.

One's reaction to the first lines of a recent *Times* leader, therefore, might have been a relieved feeling that this was a good lay-commentary providing a nice summary—if not original thought.

Its chief argument is that the Gas Council and the area boards—'a highly decentralised organisation for the nationalised gas industry'—is not a sufficient rationalisation when 'production of gas from coal must for efficiency be concentrated in a relatively few areas, and a large proportion of the gas used in most areas should be produced outside these and brought to them through a national grid.' The leader, which is inspired by a paper to the British Institute of Geographers by Mr. G. Manners, postulates a body for gas analagous to the Central Electricity Generating Board. So far, these ideas are reasonable, if not exactly new. But at this interesting point the argument is abandoned in favour of a weak plea for what seems to be a kind of national fuel policy. 'Whatever administrative changes are made it is desirable that they should provide adequately for co-ordination not only within the gas industry but also, where it is appropriate, between all the nationalised fuel and power producers.' This is not adequately presented. What kind of co-ordination? Appropriate for whom?

Mr. Manners suggests that there should *also* be some co-ordination between the policies of the gas and electricity authorities 'in distribution.' *The Times* leader goes on: 'Both subsidise sales in country towns and rural areas by their sales in towns; he [Mr. Manners] thought duplication of losses should be stopped by providing only the more versatile electricity in these areas. Those who suffer from failures of electricity in rural areas in hard weather may well disagree and certainly this is a more controversial subject. But increasingly the organisation of the gas industry is likely to be under review.'

From this confusion of ideas, especially the innuendo of the last sentence, in which it is very difficult to tell whether *The Times* approves of Mr. Manners' negative proposals or not, the puzzled reader might well be inclined to feel that the gas industry must be under some sort of cloud, at a time when recent events have established that it is one of the best-conducted of public industries.

Handicapped person's cooker

IT is pleasant to be able to report that the handicapped person's cooker designed by the Gas Council is at last becoming available. It received considerable publicity some time back when gassing fatalities involving old and disabled people were in the news; perhaps reference to it at that stage, although a little premature, was considered necessary for reasons of publicity. At all events the Gas Council has now released a full description of the appliance, which is manufactured by Sidney Flavel & Co. Ltd.

There are two models, the G.C.1 and the G.C.2, and the cooker can be bought at a cash price of about £30 (excluding fixing) or on hire purchase terms, and it will also be possible, on recommendation, to obtain the cooker on hire at a rental of 2s. 6d. a week, including fixing. The National Assistance Board and the Society of Medical Officers of Health have agreed to co-operate by identifying and recommending to the gas boards people to whom the cooker will be of help.

GAS JOURNAL March 30, 1960

From a paper to the London and Southern Section of the I.G.E., January 19, 1960.

Electronics in the gas industry

By M. NEEDHAM,

JOINT GENERAL MANAGER, ELLIOTT BROTHERS (LONDON) LTD.

and

J. H. WHITAKER,

LATELY SALES DIRECTOR, PANELLIT LTD.

Part 2

THE first part of this paper has dealt with various methods of measurement and control by electronic instruments with a certain amount of elementary computing. It is now proposed to describe what is probably the most powerful tool yet produced for industrial application, but first of all it will be useful to trace the origin of the present equipment.

Several years ago the need to measure and give alarm for any off-normal condition of process variables where the number of points of measurement ran into hundreds, gave rise to equipment which went under several names—'data reduction,' 'data logging,' 'monitoring equipment,' and so on. But whatever the name, the equipment amounted to a means whereby information from all the points to be measured was sequentially fed into an equipment, which checked whether the measurements were within a prescribed 'safe' tolerance: If they failed to do so, an alarm was given and recorded on a strip printer. Once an hour—or at any other period as was desired—the equipment provided a complete log of all the measurements in black type for normal and red type for off-normal measurements. Thus the user had an easily read document of a vast number of measurements, more easily digested than hundreds of charts from the conventional recorders.

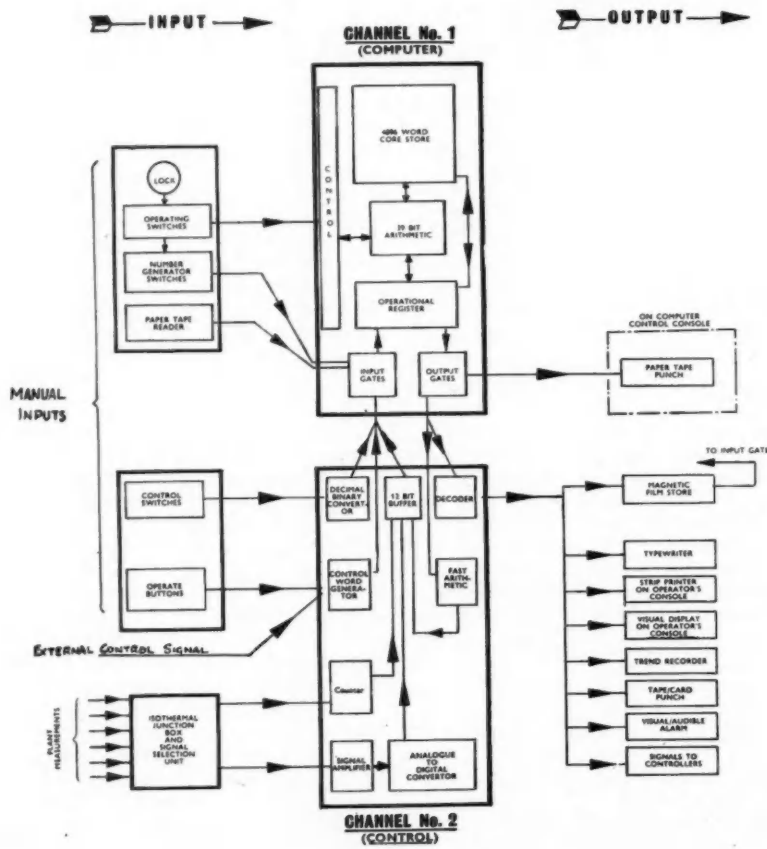

Fig. 4. Diagrammatic layout of the Panellit I.S.I. 609 system.

The equipment was capable of carrying out certain very elementary computations such as integration of flows and averages of pressures and temperatures.

Basically it consisted of a large number of post office type relays which governed the programme of operation of the machine, uni-selectors which brought in through sealed relays the signal to be measured, two amplifiers for the detection of high and low out of limit measurements, and a means of measuring the actual value of the measured point and converting this into digital form.

The method of measurement was essentially a potentiometric type of recorder but with the paper chart omitted and a digitising disc coupled to the shaft of the potentiometer drive.

From the use of this equipment by the chemical, power and oil industries, the idea was conceived of similar equipment but of greater flexibility in use and provided with a means of carrying out a large number of computations, some of which would be complex.

Life of components

The engineers responsible for the design of the newly envisaged equipment had to consider a number of factors.

1. If an equipment could carry out on-line computation, there might be a possibility of eventually employing the equipment to optimise the whole of the plant operation. This demanded that on-line availability must reach the highest possible standard and that the designers must search for components which would have virtually infinite 'life.' Technical developments in the guided weapon field had already caused a flood of transistors to appear, and their success in various fields made it imperative that the ordinary, well tried valve should be discarded in favour of selected types of transistor.

2. To provide a high speed equipment capable of great flexibility and able to carry out a large number of complex calculations, a digital computer must be built into the equipment, which must also be entirely transistorised. Fortunately a computer of exactly the right type was being developed which met the requirements exactly—fully transistorised, and equipped with a ferrite core memory providing a fully solid state machine.

The problems of selecting the incoming signal, measuring and converting it into digital form remained. The incoming signal could be of two basic types, a low level signal at .6 mV.—for example a thermocouple output—or a high level signal at .5 V. to 10 V. Great care is needed when a low level signal of say 10 mV. has to be switched into circuit, amplified and measured. This demanded a choice of relay which could operate at high speed, have a minimum of contact 'noise,' a minimum and consistant resistance coupled with an extremely long life. The only relay to meet these requirements fully was the mercury-wetted contact type which has a life in excess of 1,000 M. operations or 500 years, which should be adequate.

The measurement and digitising of the signal must be fast and accurate, and a form of comparator using precision resistors switched by transistors, was clearly the answer; an accuracy of .1% of full scale and a digitising time of 3 milliseconds was essential.

It was therefore around these selections that the design philosophy centred, and a system known as the Panellit I.S.I. 609 came into being. It consists of a number of interconnected assemblies. The diagrammatic layout of the system is shown in Fig. 4 and comprises five basic elements: (a) Channel 1—computer, (b) channel 2—control, (c) main input, (d) analogue or process signal input, and (e) output.

The operation of the whole system is governed by the computer-channel 1, where a ferrite core memory stores the operational programme, the high and low limit points, and the equations for computation of results, etc. The purpose of channel 1—control is to handle the incoming process signals and shape these to match the operation of the computer.

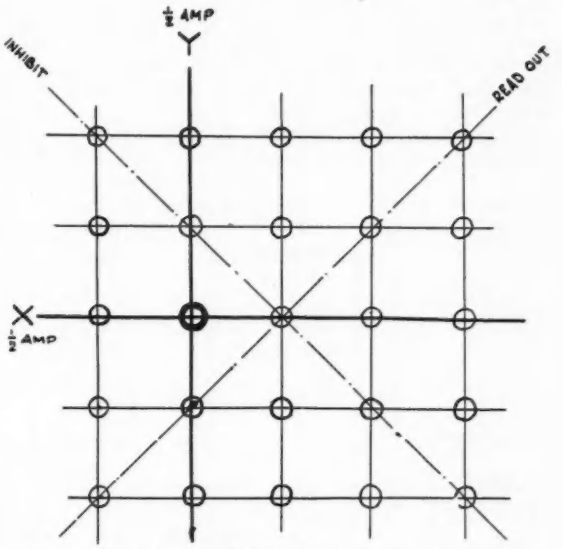

Fig. 5. Detail of single memory plane.

A general description of the system in simple language will perhaps help in appreciating the high degree of sophistication which the system enjoys.

Memory for commands

Channel 1—computer is the 'brain' or centre of the system. At the absolute centre of the computer is the store or memory which can carry all the commands and instructions put into it by the engineer. Such instructions are held in coded form.

The store consists of a large number of small magnetic rings of 2 mm. in diameter, arranged in a number of planes, each of which contains a matrix of 4,096 rings arranged in 64 rows of 64. A number of wires run through these rings so that any single ring—or core as it is called—can be addressed. A simple explanation will serve to show how this is done. Take, for example, a single plane matrix of cores with wires running through at right angles. If now an electric current is passed through any two wires at right angles to each other such as x or y in Fig. 5 it follows that one ring will receive twice the current loading of any of the others. If therefore a ring, or core, can be magnetised by a current of 1 A.—but not by any current value less than this—then, if the current is limited to exactly ½ amp in wires x and y, the one selected core will become magnetised.

In practice the passage of current takes the form of a very rapid pulse of only 3 microsecond's duration. Thus the state of a core is changed at a very high speed. This action of placing a core, or 'bit' in a magnetic state is known as 'reading-in' or to 'read-in'; to 'read-out' is to examine the cores and determine which cores are in a magnetised condition.

To read-out from the store or memory a further wire passes through the core, and a pulse fed down this wire senses the resistance—since it is in opposition to the first pulse—and hence a magnetised core is detected. A single 'bit' in itself does not provide sufficient information and

it is arranged that the 'bits' are grouped into 40 'bits' and form what is called a 'word.' One or more 'words' may be used as an instruction or as a record of a limit which has been set into the machine. The store may be considered as a very large nest of pigeon holes where instructions, data or constants are held.

Since the store is the heart of the computer, it must have connection with the outside world. A means is provided of addressing the store to read-in or read-out information and transfer it to another section for further processing. Fig. 6 shows diagrammatically a control unit and arithmetic unit.

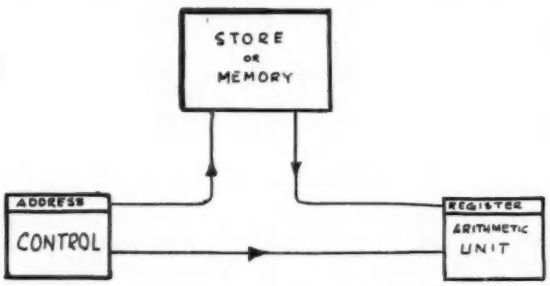

Fig. 6. Store, control, and arithmetic unit.

At the control unit an instruction may be given to read pigeon hole No. 5 and in this pigeon hole a further instruction states 'take contents of pigeon hole No. 56 and place it in register.' The next action at control may then be: 'Read contents of pigeon hole No. 92 and subtract from register; if the result is positive take no action but if negative sound alarm.' This describes the action taken to compare a measured signal with a limit already set into the store.

It must be appreciated that the above action would have taken place in about 1 millisecond. Thus in the time it takes to say 'Jack Robinson' the machine will have taken about 750 such steps. Another way to visualise the speed of operation of the machine is to compare the action of pressing a button to sound a horn. Provided that the horn responds in one-third of a second we are only conscious of instantaneous response, but in the same period of time the computer can carry out about 450 additions. It is important to have an appreciation of this speed.

The computer is only capable of receiving digital signals in a certain form and as each plant application will be different it is necessary to place before the computer a means of selecting the point to be measured, linearising, scaling, square rooting, measuring and digitising. This is the function of channel 2 (Fig. 7), which contains the mercury-wetted relays in trays, each tray containing 64 selection relays. They are arranged in a matrix and they may be selected in any random order at a speed of five points per second for low level signals and higher speeds for high level signals.

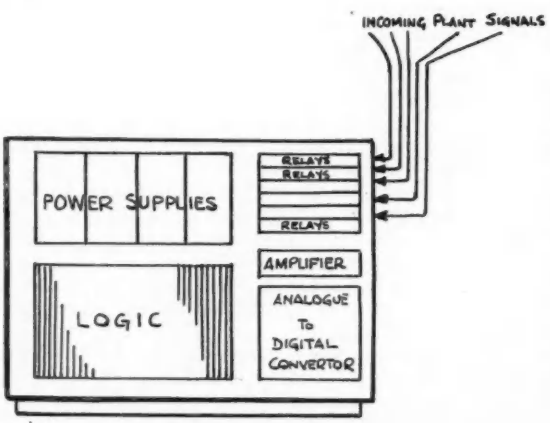

Fig. 7. Channel 2—control.

This section also contains the digitiser which receives the input signals after amplification. The method of digitising is shown in Fig. 8. The selected input signal is passed to an amplifier and fed to a step by step comparator. A comparison is made against a standard reference voltage and the digitiser switches resistances into circuit until a balance—denoted by zero voltage—is achieved. The resistances are brought in one by one beginning with the most significant value representing half full scale. If the first resistance is too high a value it is switched out of circuit and the next value of quarter full scale is selected. Assuming that this value is too small it is left in circuit and the remaining resistances are in turn brought into circuit and accepted or rejected according to whether they are too small or too great. Thus when the digitiser has passed all the 12 switches, there will be a number of resistances in circuit, and from the switch position the digital output in binary form is provided.

Individual transducer

The incoming signals may be pneumatic or electric, but the former must be converted into an electrical signal; this means providing an individual transducer at each point of pneumatic measurement, the cost of which immediately stresses the advantage of a measuring instrument directly capable of providing an electrical output. Manual inputs are demands by the plant operator for immediate information or a change of an alarm level.

The output from the system may take a variety of forms such as complete log on a typewriter or an alarm given aurally and visually with a record on a strip printer. In addition a punched tape or magnetic tape record can be made for a large history store for use for long-term analysis.

The solution of equations may be presented and in fact a massive amount of valuable information can be given with correlation to enable an analysis of the plant to be made. From such an analysis empirical or rational formulæ can be developed and such formulæ used by the system to feed back signals to control the set points of single loop controllers to optimise the plant operation. It is in this latter operation that the future of many industries lies. It must, however, be admitted that the production of optimising equations is an extremely difficult task and much hard work lies ahead to reach the hallowed goal of automation. Nevertheless, there are several companies who have been bold enough to grasp the possibility and their approach is a logical one of step by step.

The digital computer, the brain of the modern data processing system, is a powerful but complicated instrument. Unless it is applied with considerable sophistication and care, it will never realise its full potential in industrial control. On the other hand, its capabilities are impressive. For those who are willing to devote the time and effort required for its intelligent application the rewards will go far beyond the more obvious savings from fuel and labour cost reductions. For those who expect an immediate short cut to automatic plant control, frustrating delays and disappointments may be in store.

There is a logical sequence to the steps towards complete

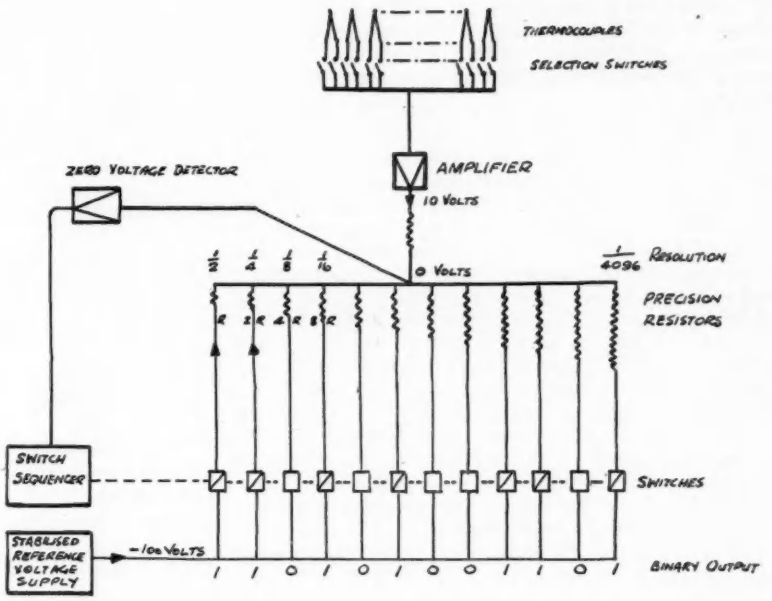

Fig. 8. High-speed, solid state digitiser.

automation and this embraces an information phase, phase A, which can be made operational *today*. For these services the digital computer is ready to go on-line. For the second phase, which is *automatic control*, phase B, the information and computing system is ready, but the simple fact is that the plant is not. The step by step programme for station automation may be summarised as:

Phase A. Control from information.

1. Monitoring plant operation.
2. Refining plant content.
3. Performance calculation.
4. Comparison with predicted results.
5. Programming—sequential operation of plant auxiliaries.

Phase B. Automatic control.

1. Automatic sequencing of accessories—pumps, fans, compressors, valves, etc.
2. Combustion efficiency.
3. Automatic plant start up and stop.
4. Automatic gas despatch.
5. System (plant) organisation control—including feedback and programming.

The sheer volume of engineering and design effort needed to prepare a generating station or a gasworks for automatic start, stop and control is such that considerable time must elapse before it can be studied, evaluated and built into safe reliable control gear.

Sophisticated and beautiful

It is possible today to install a data processing system with sufficient sophistication not only to make all the steps of phase A operational but to open the way for an orderly and systematic attack on phase B. The beauty of such an approach is that it can be applied at once to those problems for which the know-how is adequate, and can be used simultaneously as an analytical tool to develop the information needed for the more complex phase of automatic control. Finally, when the techniques are developed and the plant equipment made ready the same computing system can take over as an automatic controller.

This step by step approach is not only the most likely to justify itself economically but it is also the fastest and surest road to complete automatic station control.

DISCUSSION

Mr. T. A. Lucas, S.E.G.B., opening the discussion, said that this was a very forward-looking paper, most appropriate and timely. The use of the systems described was becoming clearer to the gas industry, and their application more feasible and less remote. Equipment was improving and the gas industry was undergoing a face lift. Fewer and larger production units were being built and more was being spent on instrumentation. If this was put at 5% of the total spent on a works, a £1-mill. works would allow up to £50,000 for modern instrumentation. Distribution systems were also becoming bigger and more complicated, and instrumentation was coming into its own to improve their communications. The control room was now an accomplished fact.

Up till 1950, most town gas had been made by carbonisation. This was a traditional and long-standing process, which over the years had been improved upon and had ultimately become very efficient. There was little to be gained from instrumentation for such a well tried and highly developed process, but for new gas-making processes about which little was known, and for which the time available for really effective exploitation was short, sound reliable instrumentation would be able to improve its operation more quickly; money would be saved and there would be a guarantee of a better product. Very shortly these new ideas would need every assistance to attain optimum efficiency.

It was a difficult choice for the gas engineer to make, when embarking on instrumentation, whether to install a pneumatic or an electronic system. The cost of the equipment could be easily estimated, but what of the costs of installation? There were also heavy charges for labour and maintenance, and he asked Mr. Needham for comparable figures for all these costs.

Mr. Needham said it was impossible to give a general answer, since there was little information about maintenance charges available except from a refinery. From a direct comparison between the two systems, there appeared to be a saving of 15% for the electronic system, since there were fewer replacement parts. It was even more difficult to give comparable figures for installation costs,

but in very large plants, they were high for the pneumatic system; difficulties were caused by the freezing up of impulse pipes. In electronic systems the power supply was more easily available; in the U.S.A., at any rate, it was the cheaper to install.

Mr. J. H. Woodham, N.T.G.B., said that it had been a very difficult paper to absorb, and complained that there had been no advance copies. Mr. Needham had discussed instruments and Mr. Whitaker computation. There was clearly little application for the latter in the gas industry. In the last ten years, there had been a good deal of development of instrumentation for remote control holder stations. Much of this equipment had been of Elliott's manufacture. It was all simple equipment, however, and the plainest possible type of information had been transmitted. Unless there were a number of stations working under a central control, computation would not be needed. At present the set-up was only a valve room operator and a computer would only be needed when the logging of instruments was superseded. He asked for more guidance in the choice of a pneumatic or an electronic system. In his opinion the control system at a holder station should be electronic.

Referring to the use of plug-in units, Mr. Woodham said that the finding of the fault was where the skill was needed. Once this had been done, the spare plug-in unit was of the greatest use, but someone must be employed to find the fault first. He asked whether the designers of the equipment were aware of maintenance problems, and if so were they thinking of a 24-hour emergency service.

Mr. Whitaker, replying, said that at the moment computers were out of the question for the gas industry. Throughout the world, there were only 30 on order by industry. In the U.S.A. du Pont had ordered three. When the possible advantages to be gained by their use had become clearer, there was a chance that further approaches might be made. At present there was no saving in labour to be expected, but the quality of the product was much higher.

Referring to maintenance, Mr. Whitaker said it was only natural that the gas industry would not have a man who could maintain such delicate instruments. When several installations had been built, a gang of skilled instrument mechanics could be employed, but until then it was only fair to expect the instrument manufacturer to be responsible for maintenance.

Mr. Needham, also replying to Mr. Woodham, said that designers were well aware of maintenance difficulties. To help in the location of faults test points were provided and simple testing equipment was available. Whenever a piece of equipment was found faulty, it could be taken out and replaced by plugging in a standby unit. If need be, there could then be an inspection by a skilled mechanic. The cost of replacement units was low enough to make it worthwhile holding them in stock.

Mr. S. S. Francis, Woodall-Duckham Construction Co. Ltd. expressed great interest in the paper, and commented on how largely electronic controls had begun to loom in the lives of everyone. He asked how a movement of 1/10 in. or 1/20 in. could be converted into one of 6 in. to 36 in. to do useful work, when no mechanical or pneumatic power had been mentioned as part of the electronic systems.

Mr. Needham, in reply, said that the electronic system was a very reasonable means of carrying out remote control and the system was not impossibly complicated. A valve operator, employing a thermo-vapour mechanism and a valve stroking rate of 1/20 in. per second, controlled electronically, was an effective means of carrying out an operation from a distance. But so far only a few of these appliances had been made.

Mr. J. E. Davis, S.E.G.B., said that the gas industry was still very far from using computers to control its plant. Gas engineers were not yet ready to give precise instructions to a machine to carry out any process connected with gas-making or distribution. Computers and optimisers were a great challenge to the complete understanding of the processes involved. These instruments made ideas much clearer, and they could be properly instructed even if it meant using binary units to do so.

To illustrate his reply, **Mr. Whitaker** drew an echelon control system on the black board and showed how pairs of parameters were optimised, followed by the optimising of the optimisers.

Mr. L. J. Clark, N.T.G.B., proposing a vote of thanks, said that traditionally the gas engineer was a Jack of all trades, and it was most stimulating to listen to two experts talking of a new tool. The authors had been very fair and had not been afraid to speak of its limitations.

Everyone in the industry realised the need for improved methods to reduce costs and to raise the quality of the product. The North Thames Board were installing mechanised accounting. Mr. Lucas had spoken of the time needed to develop the old techniques and skills. For new processes, new techniques would be very useful, especially when the raw material was liquid. The economic aspect of the development and use of new methods was of great importance, but such developments must not deprive anyone of the duty to think for himself, as some American automation devices did.

The authors had given the industry its instructions and it was now up to the industry to act.

Calcium-base greases

A NEW British Standard for calcium-base greases (B.S. 3223:1960) rationalises specifications by providing a range which satisfies the same general requirements for composition and quality but differ in consistency and in the viscosity of the lubricating-oil component. Twelve categories of grease are included in the specification (three consistencies for each of four oil viscosity ranges) and standard designations are given.

Requirements are specified for: Composition, consistency, change in penetration on prolonged working, drop point, free acidity and free alkalinity, water content, oil separation and copper corrosion. Resistance to heat may be specified as an optional requirement for certain categories of grease. Where appropriate, IP methods of test are used. An appendix gives information on the suitability of greases for dispensing by means of lubricating equipment.

This range of greases is designed to provide grades for all operating conditions within the normal scope of calcium-base greases, but a warning is given that the selection of suitable grades for particular applications is a matter for lubrication technologists and not for the ordinary user.

Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1 (7s. 6d., postage extra to non-subscribers).

From a paper to the Midland Section of the I.G.E.

Operation of grid systems in the East Midlands area

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THE geographical situation of the East Midlands Gas Board exerts an influence on its economy in the following ways:

1. The coal fields in the area mean that coal must, for the present, be the main source of fuel.
2. The coal fields are in the northern part of the area and the cost of making coal gas there either in coking plants or in the Board's own plant must be less than in the southern part of the area.
3. The coal fields have led to the installation of coking plants by the National Coal Board and others.

Modern methods of gas manufacture are considered to be most economic when applied to large works, and it necessarily follows therefore that there are only three possible sites for such works in the area: (a) At the pit head where the cost of coal transport is negligible, (b) at steelworks where the coke is used on the spot, and (c) at large gasworks where there is a large consumption of gas and coke in the neighbourhood. If a plant is sited elsewhere, there can be no hope of economic operation and costs must be high.

Common system of control

Since gas in substantial quantities can be transmitted by pipe-line at a cost of transportation lower than can be achieved for any other form of energy with the exception of certain grades of oil similarly conveyed, the reasons for laying the grid systems and the closure of the smaller works, particularly in the southern part of the Board's area, are apparent. The regional grid systems have been developed independently to meet different conditions and consequently the methods of control vary a little. The grids are now under the direction of the Chief Engineer and Production Controller, and it is hoped to arrive at a common system of control in the near future embodying the best from each.

The crude gas grid in the northern production region was laid in the early 1930's and was designed to collect the surplus gas from the coke oven plants and transmit it into Sheffield and Rotherham for purification before distribution.

The purified gas grid which has been laid since vesting day also collects the surplus gas from certain coke oven plants, together with the gas not required to meet local consumption at Car House gasworks, Rotherham, and transmits it into Sheffield. The consumption of gas in Sheffield and Rotherham represents about 80% of the total gas distributed in the northern production region.

The main sources of supply for the southern production regional grid are the four coke oven plants and Litchurch gasworks, Derby. At no other works in this region is sufficient gas normally manufactured to meet the local consumption, and in consequence the other manufacturing works in the cities and towns receive a supply from the grid.

The northern production regional grid can, therefore, be regarded as supplying a centre of consumption in Sheffield, while in the southern production region manufacture is carried out at central points and the gas is distributed outwards.

The Board purchase a very high percentage of coke oven gas which is now rather more than 59% of the total gas distributed. To enable this large volume of coke oven gas to be accepted it has been necessary to install at the Board's works complimentary types of gas-making plants, which are flexible in operation, and to provide gas storage and together these make up the difference between the constant supply of coke oven gas and the widely varying demands of the consumers.

Due to the base load nature of the coke oven gas supply, the incidence of the 5-day large industrial load, mainly in the northern production region, where little or no industrial gas is required at weekends, gasholders probably perform a more important function in this Board than in any other. The gas made during the weekend must be stored for use during the week, and a 5 mill.-cu.ft. capacity gasholder can be equivalent to a manufacturing plant of a capacity of 1 mill. cu.ft. per day.

The control of gasholder stocks is dealt with more fully later, but normally the total stock held by each grid on Friday evening each week represents between one and two hours' output. During summer months the target stocks

are worked to even closer margins, and these risks are deliberately run in order to make the best use of base load gas.

The problem of the weekend/weekday output is a very serious one, and the holder storage required to control the position depends upon, (a) the average weekday consumption, (b) the weekend load factor, and (c) the flexibility of gas-making plant.

To maintain the economic amount of holder storage in relation to the volumes of base load gas available and the increasing industrial load, has required the construction of over 30 mill. cu.ft. of holder storage since vesting day. Three new holders are at present being constructed, one at Effingham Street works, Sheffield, of 5 mill. cu.ft., one at Basford works, Nottingham, of 3.3 mill. cu.ft., and one at Litchurch works, Derby, of 6 mill. cu.ft. Some of this capacity is replacement of smaller and old gasholders which are past economic repair. Since new gasholders are, however, expensive to construct, it is essential in the interest of avoiding capital expenditure, to minimise holder construction to that required for the economic operation of the grid systems.

For administrative purposes, so far as the engineering and production department is concerned, the Board's area, excluding Lincolnshire, is divided into two regions, the northern and the southern, and each is under the control of a production engineer.

Each grid has a maximum daily output of between 125 and 130 mill. cu.ft.; the northern grid takes in daily about 57.5 mill. cu.ft. of coke oven gas and the southern grid about 49.5 mill. cu.ft. The overall control of both grid systems, including the bulk distribution mains, is under the control of the Chief Engineer and Production Controller at the operational headquarters at Derby, and the grid control figures are available to him by 9.30 a.m. each day.

The area comprising the northern production region consists mainly of the West Riding of Yorkshire, together with a part of Derbyshire and a small strip of Nottinghamshire and Lincolnshire. The centre and main district of consumption is Sheffield and Rotherham, which represents about 80% of the output of the region.

The Sheffield area is an important steel production centre and a great deal of gas is used in the manufacture of special steels. Industry takes the greater proportion of the output and this has considerable influence both on the type of plant installed and upon the method of control and operation of the region, which is centred on the South Yorkshire coal field, the largest producer of coking coal. As a result, a considerable coking industry has been built up. The fact that large volumes of coke oven gas have been available for a long period has had a marked effect upon the development of the region.

The coke oven gas is looked upon as base load and coal gas plant has been installed to such a capacity that, allowing for the normal repair programme, its total available capacity can be operated under base load conditions.

Wide variation of loads

A feature of the load characteristic is that since a large proportion is industrial, there is a wide variation between weekday and weekend loads. As previously stated 75% of the demand occurs between 6.0. a.m. Monday and 6.0. p.m. Friday. For this reason it is necessary to maintain maximum production of coal gas during the week, making reductions at weekends by (a) carrying out all scurfing at weekends, (b) rich gas underfiring on some plants and (c) standing retorts empty. The intermittent vertical chambers at Rotherham and the horizontal chambers at Neepsend are equipped with the necessary arrangements to carry out rich gas underfiring.

Provided that there is a ready sale for coke, the production of gas in a setting underfired by rich gas can be shown to be slightly more economic than in the case where producer gas underfiring is used. Control of gas production during present times must be exercised with a view to preventing any undue build up of stocks of coke for which the market to say the least—is doubtful. It is, therefore, of great value to operate plants of a static type on which gas or coke outputs can be readily varied over a considerable range, although the use of rich gas underfiring cannot be used to the best advantage under present conditions.

The bulk of the Board's coal gas plant is of static type and it is contended that this type of plant is more flexible in meeting varying loads while maintaining a constant calorific value. They are also quick and easy to start up after standing.

Release of coke oven gas

A further aid to flexibility is the fact that one of the larger coke oven plants is equipped with mechanical producers and is designed to be underfired with either producer gas or rich gas. Under conditions of normal demand producer gas is used, thereby ensuring maximum release of coke oven gas. At weekends and holidays etc. when the demand for gas falls, the plant can, if required, be changed from producer gas to rich gas under firing, thereby reducing the volume of gas available by 5.5 mill. cu.ft. per day.

The total holder capacity available for stock control at grid connected stations is 62 mill. cu.ft. At present a holder of 8 mill. cu.ft. is out of action, making an effective stock of 54 mill. cu.ft. There is in the course of construction an additional 5 mill. cu.ft. holder in Sheffield which will bring the capacity up to 67 mill. cu.ft. in two years time. The bulk of the output is centred on Sheffield and Rotherham and, in accordance with the principle of storing the gas as near as possible to the point of consumption, the greater proportion of holder capacity—some 51 mill. cu.ft.—is situated on the main works.

There are in addition 26 small holder stations situated at strategic points in various small areas of supply. The stocks held in these are not normally controlled and are not therefore recorded as working stock, but they are available as a reserve in time of difficulty.

The minimum stock to be attained on Friday night must vary according to circumstances at the time. It has been found by experience in the northern production region that on average the level should be in the order of 14 mill. cu.ft. at 6.0 p.m.

The northern grid system may be divided into three distinct parts, both for practical and descriptive purposes. The three Sheffield manufacturing stations, Neepsend, Grimesthorpe and Meadow Hall, are connected by a 30-in. medium pressure main, known locally as the 'driving main,' the function of which is the transfer of gas in bulk from one works to another. This main is also connected to a purification and holder station at Effingham Street. The Effingham Street station will ultimately be the control point for the northern regional system and will be the station through which the transfer of gas between north and south will be carried out.

Prior to the reconstruction of Manvers coke oven plant in 1957, seven coke oven plants were in operation in the area between Sheffield and Barnsley. A grid was constructed to collect the unpurified gas from these plants and bring it into Sheffield for purification. A number of small works at which manufacturing has ceased also receive their supplies from this grid en route. The grid terminates at Barnsley in the north.

The number of coke oven plants feeding this system is

now reduced to three and the majority of small works originally taking supplies of crude gas have been connected to a clean gas grid. The crude gas grid—which was originally laid in the 1930's—in its present form is likely to remain a part of the system for the foreseeable future with connections to Barnsley, Elsecar and Worsborough, the bulk of the gas being purified at Grimesthorpe and Meadow Hall. A connection is available so that if necessary a portion of the crude gas can be purified at the Car House works, Rotherham, though this is seldom used.

In addition, Neepsend, Effingham Street, Dinnington and Car House, receive crude gas direct from one or more coke oven plants, but these are direct supplies and are separate from the northern grid.

The most important part of the clean gas grid system is a 24-in. high pressure main which runs north east from Grimesthorpe to Doncaster. Into this main is connected the Manvers coke oven plant which supplies some 16 mill. cu.ft. per day of purified gas. The terminal point at Grimesthorpe is connected to Effingham Street by means of the Sheffield 'driving main,' thus forming what will be the northern section of the 'backbone main' when both regions are eventually connected. A branch from this main runs north east to Barnsley and then east to Penistone, supplying purified gas to stations which used to receive crude gas from the northern grid.

From Doncaster a main runs south to Worksop into which is fed purified gas from Harworth coke oven plant. The southern portion of the ring runs roughly south east from Effingham Street and Grimesthorpe works to Worksop. This leg is also supplied with gas from Dinnington works. A further leg runs south from Neepsend and Effingham Street to Matlock and supplies a number of small stations en route. At present Matlock is supplied from the southern regional grid, and facilities exist for a minor interconnection at that point.

In planning a method of grid control for such a system as described, there are a number of requirements which must be fulfilled.

1. Gas must be available in the right places, at the right times and in sufficient quantities.
2. Available plants must be operated with maximum economic efficiency.
3. An up to date picture of the exact situation must be readily available at all times for the consideration of the responsible officer.
4. Adequate communication is essential.

Central control room

The northern region grid systems are operated from a central control room at northern production region headquarters in Sheffield. The control room is manned continuously by specially trained clerks who are under the control of a member of the Production Engineer's staff.

The meter readings from all coke oven plants are relayed to the control room by land line so that the performance of the ovens is known at all times. There is, in addition, direct telephonic communication with all coke oven plants. Direct telephone lines connect the control room with the valvemen at all manufacturing stations and with a sub-control at Wath. The function of the sub-control is, (a) to collect and summarise stocks from a number of small holder stations, and (b) to monitor the supply of gas from Manvers coke oven plant.

Under normal conditions, the makes, stocks and outputs are summarised every two hours, but in times of exceptional conditions, the summaries are made up hourly. All instructions for starting and stopping plants are given from the control room, as are all instructions for alterations to grid pressures to enable movements of gas to be made as required. The pressures at all critical points in all the grids are reported hourly and logged at control.

Apart from annual forecasts which are prepared for budgetary purposes and to determine overall production and repair programmes in relation to estimated demand, effective control is exercised on a weekly cycle commencing at 6.0 a.m. on Monday morning. A large proportion of the northern regional load, some 70%, is industrial, consequently as mentioned earlier 75% of the total weekly output occurs between 6.0 a.m. Monday and 6.0 p.m. Friday. Production must therefore be so controlled as to start with maximum stock at 6.0 a.m. Monday, falling to minimum stock at 6.0 p.m. Friday, or a little after.

The regulation of minimum stock on Friday night is necessary to hold maximum available volume of base load gas made or received during the weekend.

Turning to the flexible plant and pursuing further the theme of economic operation, arrangements are made whereby oil gas plants are first on and last off. It is, however, more economic to operate the larger carburetted water gas units which draw coke direct from supplies made on the same works, than it is the smaller plants on stations to which coke has to be transported. In the operation of water gas plants, control of coke stocks must also be considered. Where p.f.d. is used for enrichment it is obviously more economic to work plants so equipped instead of those using gas oil. Thus, control is exercised so that the required amount of carburetted water gas is produced as economically as possible.

Weather warning

In addition to the ensuing increase in consumption, bad weather affects the performance of gas-making plants, and perhaps, in this respect, coke ovens are a little more susceptible in view of their exposed positions. It is of advantage to have preliminary warning of the onset of such conditions. The control room at Sheffield receives twice a day a detailed weather forecast from the R.A.F. Meteorological Station at Bawtry. These forecasts have been generally found to be accurate both in terms of type of weather and temperatures. An additional service provided is notification of any substantial change from the original forecast.

The effect of temperature on output in the northern production region is considerable. Over the range 40°F. to 28°F. a variation of 1°F. in the average temperature makes a difference of 5 mill. cu.ft. in the weekly output. On a daily basis, the effect on a normal weekday is that 1°F. variation in temperature may alter the output by .8 mill. cu.ft. per day. Thus a fall in temperature from say (36°F. to 28°F., can increase output by 6.5 mill. cu.ft. per day—and under winter conditions such falls in temperature are not uncommon. When conditions of high output and uncertain input are likely to be encountered, the intelligent use of weather forecasts enables stand-by plant to be brought into operation in time to minimise the effects.

The pattern of output previously described varies little between normal winter and summer weeks. Later years have been somewhat affected by the industrial recession of 1958-59, which happily now appears to have ended. The ratio of average summer week to average winter week is 1:1.25, a ratio which enables the region to make good use of its base load plant.

The southern production regional grid extends from Chesterfield to Northampton, through Derby and Leicester with a major branch connecting Stanton and Nottingham, and numerous smaller branches connecting gasholder stations to which bulk supplies are given. The total length of the grid system, as distinct from local distribution systems is 550 miles.

Supplies to the grid are provided from seven of the Board's gasworks, three coke oven plants operated by the National Coal Board and one coke oven plant operated by Stanton Ironworks Co. Ltd. All coke oven gas is purchased purified to specification and can therefore be pumped directly into the grid. Altogether, 72 non-manufacturing gasholder stations are provided with bulk supplies.

The present maximum demand over the area served by the southern regional grid is 782 mill. cu.ft. per week at 480 B.t.u. per cu.ft. with a load factor as between week-end day to weekday of .727 and the characteristics of the load are such that the week may be conveniently divided into 4½ weekdays and 2½ weekend days. The anticipated maximum day's demand at 28°F. is 130 mill. cu.ft. to meet which there is a total installed capacity of manufacturing plant of 140 mill. cu.ft. per day, made up as shown in Table 1.

TABLE 1

Type of gas	Capacity mill. cu. ft. per day
Purchased coke oven gas	49·5
Coal gas	43·5
C.W.G.	27·1
Catalytic oil gas	16·0
Producer gas	4·0

The Board's coal gas plants in the southern region are almost exclusively continuous verticals.

The agreements for the supply of coke oven gas provide for approximately equal daily quantities throughout the year with facilities for some reduction at week ends and holidays. The minimum summer week (excluding industrial holidays) represents 57.5% of the maximum winter week. With 20% of the carbonising plant off for resetting and the remainder fired with producer gas, the coal gas available together with the coke oven gas, provides the full requirements for summer demand when the atmospheric temperature is *below* the average for the time of the year. To provide flexibility for average or higher than average temperatures, coal gas can be used to provide up to 40% of the fuel requirements of the settings and this gives a possible reduction of 4 mill. cu.ft. per day or about 6% of the summer demand. Experimental work is in hand to increase the proportion to give a greater reduction. Week/week-end daily flexibility is provided by scurfing on all the Board's plants at week ends, programmed reduction of gasholder stocks to reach a minimum figure by 6 p.m. on Fridays and, when required, reductions in coke oven gas purchased during week-end days. This method of working makes it possible to avoid the manufacture of the more expensive peak load gas during the summer period and to keep the use of such plant down to a minimum at other times.

Week-end scurfing

Flexibility in the winter is achieved by week-end scurfing and use of gasholder storage capacity as during the summer period with the addition of peak load plant for the production of catalytic oil gas, carburetted water gas and producer gas.

In the southern production region the cost of gas production in plants operated by the Board is in the following ascending order of magnitude, provided that coke produced can be disposed of at normal prices: (a) Coal gas with rich gas firing, (b) coal gas with producer gas firing, (c) oil gas, (d) carburetted water gas—gas oil enrichment, (e) producer gas—oil enriched. To achieve maximum economy in operation, therefore, the plants other than baseload are brought into service in the order stated above and the maximum use is made of each method of production before bringing in a process at a higher cost.

There are, of course, further sub-divisions as some coal gas plants and water gas plants are more efficient and favourably placed as regards net cost of materials used and and labour required than others, *e.g.*, fully automatically operated water gas plants are used in preference to manually operated. There are even degrees within those categories. Similar fully automatic water gas plants are installed at Derby and Leicester but gas can be made more cheaply at Derby, which is a coke exporting works—Leicester is an importing works—and Derby comes within a lower price zone for oil. Savings in materials costs here more than offset the pumping cost. The conversion of water gas plants at Derby to use petroleum residue as an alternative to gas oil might result in an equation of cost of production with oil gas. This conversion has only just been completed and it is, as yet, too early to determine precise figures.

Re-compression

The grid was designed for the primary purpose of transmitting gas from north to south and particular emphasis was laid in planning on the avoidance of pumping the whole of the requirements up to a maximum pressure which might be required by a relatively small proportion of the whole. Purified coke oven gas is pumped into the grid by the suppliers to give a pressure not exceeding 15 p.s.i. at Derby whence gas surplus to local requirements is also delivered into the 'backbone' main system at the same pressure (15 p.s.i.). Volumes up to 900,000 cu.ft. per hour can be transmitted from Derby in a southerly direction at this initial pressure of 15 p.s.i. When volumes in excess of 900,000 cu.ft. per hour are required to be transmitted southwards, centrifugal type compressors installed at Derby are used to re-compress either to 23 p.s.i. or 35 p.s.i as required. This re-compression is conveniently achieved by the use of two-stage centrifugal machines which, when working singly, pump at the rate of 1.2 mill. cu.ft. per hour to 23 p.s.i. or, when combined, at the rate of 1.5 mill. cu.ft. per hour to 35 p.s.i.

Considerable flexibility in bulk transmission is achieved by the tactical use of peak load oil gas plants in the southern part of the region, *i.e.*, at Leicester and Northampton. Although required as first priority peak load input for the grid, these plants were located for strategic reasons to provide some standby against possible trouble on the single main giving these areas bulk supplies. Apart from the avoidance of pumping peak requirements to the southern extremity of the system, the installation of peak load plant at Leicester and Northampton has made them virtually self-supporting for the maximum winter's requirements and, in practice, the rate of transmission from Derby in a southerly direction can vary between the maximum capacity of the re-compression plant, *i.e.*, 1.5 mill. cu.ft. per hour and a minimum figure of 200,000 cu.ft. per hour. This flexibility also permits the use of the re-compression plant at night time, thus reducing maximum demand charges for electricity.

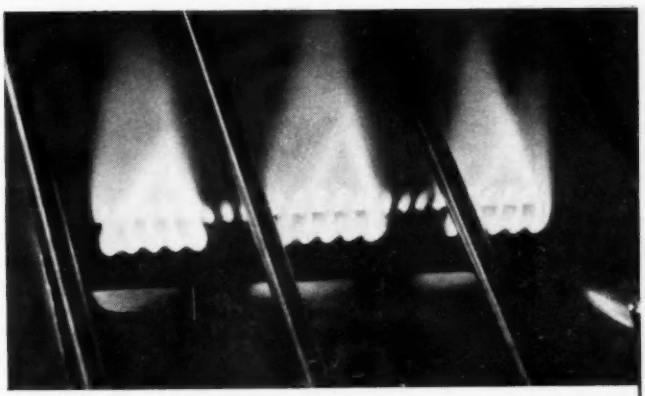
The policy of closing down smaller gas-making stations and concentrating manufacture in the larger, particularly when these are plants for the operation of which the Board is not directly responsible, makes it necessary to give most careful consideration to standby capacity available in case of breakdown. An integrated system means that each works need not necessarily have its own standby capacity but such capacity must be provided at strategic positions on the grid to cover failures due to breakdown, loss of

Thirty Three

The NEW WORLD Thirty Three introduces a hotplate of advanced design, incorporating entirely new boiling burners and full-width pan rests all made from stainless Steel.

STAINLESS STEEL ON THE HOTPLATE

The hotplate consists of three RADALINE boiling burners of an entirely new design each of a different size so as to give the maximum working space. The pan rests provide a smooth hotplate for the easy movement of pans and kettle. The separate rods which comprise the pan rests are easily removable, and cleaning is simplicity itself.



- EYE-LEVEL GRILL—THE FIRST TO BE FEATURED ON A SMALL COOKER
- TWIN PLATE RACKS—EACH HOLDING SIX DINNER PLATES
- AUTOMATIC HOTPLATE IGNITION
- 10 lb. TURKEY SIZED OVEN WITH DROP DOOR, REGULO CONTROLLED
- STORAGE COMPARTMENT—WITH DROP DOWN DOOR
- AVAILABLE IN CREAM OR WHITE RADIATION VITREOUS STAIN-RESISTING ENAMELS

NEW WORLD
PRODUCT OF Radiation Ltd.

leads the way

availability due to severe weather conditions, mains repairs, etc.

Although some installations have records of good reliability, experience has shown that coke oven plants, which are not directly under the Board's control and built open to the weather, are more susceptible to reductions in output from these causes than gasworks plant. Furthermore, coke ovens are generally installed in large units as far as batteries and gas streams are concerned and breakdowns have a proportionately greater effect. These and other factors which affect gasworks plant are taken into account and from experience over many years prudent standby capacity can be determined.

The southern regional grid is centrally controlled from a main control room at Derby, manned by one grid control assistant per shift, and a sub-control room at Leicester, similarly manned. Both are under the direction of a member of the Production Engineer's staff. At present, two-hourly readings of all input meters at gasworks and coke ovens are recorded, together with holder stocks at works and manned holder stations. All this information is logged for each station and a summary made for the whole region from which the two-hourly output is determined, a cumulo figure produced and compared with programmed figures previously estimated. This information is partly transmitted manually by G.P.O. telephone over either rented or national lines and partly by remote indication using the d.c. impulse system over rented G.P.O. lines. The supervisory equipment is principally employed for transmission of meter readings, grid main pressures and the c.v. of gas at the coke oven plants, but is also used for flow control at two important governor stations, one at South Wingfield near Clay Cross and the other at Stanton, where remote adjustment of volumetric governor settings is used to vary rates of flow from the grid into important bulk supply branches of the 'backbone' main.

In addition to the two-hourly control of the principal holder stations and works, twice daily control of most of the remaining holder stations is exercised by telephone reports at 8 a.m. and 2 p.m. and adjustments to volumetric governor settings, when required, are made by local personnel on the instructions of grid control.

A further small proportion of the gasholders are not controlled other than by limit switches operated by the holders themselves. The number of holders and the total capacity involved in each category is given in Table 2.

TABLE 2

Category	No. of holders	Capacity mill. cu. ft.
Two-hourly from works or manned holder stations	34	49·3
Twice daily holder stations ..	38	6·602
Controlled by limit switch ..	60	6·859

The supervisory methods at present in use are subject to a number of disadvantages, the most important of which are:

1. In categories 2 and 3 there is too large a proportion of holder capacity which could be made more effective if subject to a more flexible supervisory control.
2. The high cost of rented G.P.O. wires.
3. Unreliability of G.P.O. wires and relay systems.
4. Delay in collecting data to complete two-hourly totals.

Consideration is at present being given to a system of U.H.F. radio for transmission of information and remote control for a greater number of stations together with automatic printing out of data in the control room. Such a system would overcome the disadvantages of the present arrangement and would provide simple means of extension to suit any future development, *e.g.*, complete integration of grid control within the Board.

The methods employed in the southern production region follow fairly closely those described in detail by D. G. Rose (I.G.E. Comm. No. 352. Trans. **98,** 525). Economic operations depends largely on the accuracy with which requirements can be forecast and the procedure for the southern regional grid commences with the preparation of an annual production forecast based on assumed average temperature conditions adjusted for any known trends.

Weekly provisional programme

This annual estimate is broken down into quarterly, then weekly sections, and the coke oven gas to be produced and gas to be made at the Board's works, base load and peak load, is matched to the estimated demand. Forecasts are prepared in the autumn for the financial year following and at this stage repair and resetting programmes are agreed. In addition, the programme forms the basis of the financial revenue forecast, the basic data for which is prepared by each works engineer following the agreed programme. The programme is reviewed monthly and adjustments made for unforeseen conditions, either in plant availability or output trend. On Friday of each week a provisional programme is drawn up or the following week's gas production and instructions are given for letting down or lighting up carbonising plant, heating up and manning of peak load plant, etc. The grid control engineer, therefore, has a complete schedule of plant available for the following week.

Temperature forecasts are provided at 10 a.m. and each afternoon by the Meteorological Office and amendments to the forecasts are also given if any significant change is likely.

The method has proved very reliable in use and gives estimates to within an accuracy of 1½%. It is, of course, necessary to keep the output curves constantly under review and make adjustments for major changes caused by gaining or losing industrial load.

In addition to the programming of manufacture, the grid control offices programme each day, the flows required at holder stations and on sections of the grid to enable gasholder stocks to be controlled in accordance with targets. The control of bulk distribution over an area of some 3,300 sq. miles with a working storage capacity of only 29% of the maximum day requires very careful calculation and this task takes up at least half of the control staff time. The balancing at times of maximum and minimum storage is particularly delicate if blowing of holders is to be avoided on the one hand and continuity of supply assured on the other.

The two grids systems are at present distributing gas at different calorific values in the northern production region at 500 B.t.u. cu.ft. and in the southern production region at 480 B.t.u. cu.ft.—but before the grid between Chesterfield and Sheffield is completed a common calorific value, which will probably be 500 B.t.u. cu.ft. will have to be declared. The problems arising from, and the economic appreciation of, completing the grid are at present being carefully considered. The method of communications for the control of such an extensive grid system will have to be improved and consideration is being given to installing U.H.F. radio. Both grid systems, however, are well developed and could be used in the event of any changes in gas manufacturing process or new source of raw materials becoming available.

Nearly 50% of all gas sold by the Board is taken by its 7,086 industrial consumers and is sold in a highly competitive market. It must, therefore, be made available at the lowest possible price.

From a contribution to an Eastern Junior Gas Association short paper competition

Further aspects of works economy

By E. W. BIRD, A.M.I.Mech.E.,
CHELMSFORD WORKS, EASTERN GAS BOARD.

THERE is a feeling today throughout the gas industry that we are virtually fighting for our very existence and that the strictest economy and saving must be practised at all levels. At the Chelmsford works, with the price of coal at £7 4s. 6d. per ton, any saving, no matter how small, is a vital issue.

In his paper of November, 1957, Mr. King gave details of certain economy measures being carried out there then, and after much thought it was decided that the greatest savings could be realised with the producers and waste heat boilers.

Although the producer fuel consumption at Chelmsford at about 12.5% of the coal carbonised appeared to be reasonable on paper, investigation showed that there still remained a considerable quantity of carbon in the ash. How could this figure be reduced? Obviously better and more careful cleaning of the producers was one answer, but with a none too stable labour situation this way was not too easy to achieve, and, in fact, with the *best* firemen quantities of carbon are always withdrawn. The answer seemed to lie in being able to segregate by screening—that portion of the ashes withdrawn which contained the greatest percentage of carbon in a usable form.

Re-erected coke grading plant

A small derelict coke grading plant from one of the works closed down was brought into operation. The demolition, cartage and re-erection at Chelmsford necessitated a total expenditure of £180. This plant was equipped with reciprocating screens of ½-in. and 2-in. mesh, and so could grade material into fine ash, ½ in. to dust; middle ash, ½ in. to 2 in.; and clinker, above 2 in. The plant is fed by a small portable belt elevator, the lower end of which is dropped into a concrete pit. Each stoker quenches his ashes under a float controlled quencher and allows them to stand and drain. Before starting to clean his next fire he tips his barrow into the pit and starts up the grading plant. Coke picked from the large clinker is recovered with the middle ash. Previously this fuel was effectively used on the solid fuel boilers but with economies made in the utilisation of steam, these boilers have now been shut down and the labour employed elsewhere. An outlet had therefore to be found for this middle ash. Without any further separation it is now taken by mechanical shovel and thoroughly mixed with the producer coke in the proportion of one part recovered fuel and four parts coke and elevated to the producer hoppers. No difficulties in producer cleaning are experienced.

Since many industrial concerns are using oil fuel and electricity, it is becoming increasingly difficult for contractors to obtain clinker and ashes. Where a screened product is available, disposal is easy and the return remunerative. A sizing analysis of the ash from producers using the mixed fuel on a 4-day test showed a grading of fine ash 29.7%, middle recovered ash 60%, clinker 8.7%, and the coke recovered from large clinker 1.6%.

All coal to bunkers, and fuel to producers, is weighed so that results can be accurately assessed. During the last few months the economies outlined above and better producer control has reduced the fuel to producer figure (as fed) to less than 10%, and it is interesting to note that the saving of 1% of producer fuel is equivalent to an addition of one therm per ton on gas made.

With all solid fuel boilers shut down, it has become vitally important that the maximum efficiency in operation of the waste heat boilers should be obtained so that an adequate steam production be achieved to cover any instantaneous demand.

At Chelmsford the retort house contains two benches, No. 1 bench of 16 retorts and No. 2 bench of eight retorts, each with its own waste heat boiler of similar capacity. The boiler on No. 2 bench is capable of handling the waste gases from 16 retorts, but at present it is only receiving half this amount, and to maintain the stipulated minimum outlet gas temperature of 230°C. half the tubes have to be plugged.

Investigations into the factors affecting the outlet gas temperature, hence the extraction efficiency, showed air infiltration through the tube caps on the fan casing. Various methods have been used to eliminate this by use of pyruma and boiled linseed oil, but they are expensive in their use of labour. It was decided to design a simple, quick and efficient method of sealing all the tubes in one operation. A channel iron frame was bolted to the outlet boiler casing and studded to enable a duralumin cover to be fastened by wing-nuts to this frame to form a gas-sight joint on the intervening graphited asbestos jointing. The advantages of using polished duralumin in such an application were immediately apparent and the effect on the temperature of gases leaving the outlet boiler was considerable.

Reasons for improvement

The No. 2 waste heat boiler was fitted with a similar duralumin shield and it was found necessary to remove a number of plugs and expose more tubes for the passage of hot gas in order to come back to the original outlet boiler gas temperature of 230°C. The improvement just outlined was due to:

1. With the reduction of air infiltration a greater area for heat transfer was made available.
2. Benefit was also obtained from the lagging effect of covering a large portion of the casing with duralumin.

Logically, therefore, the next step appeared to be in the lagging of the entire end casing of the boiler with the exception of the cover plates and the inspection manhole. Again the outlet temperature on the gases rose and again more tubes had their plugs removed. The evaporation of this boiler has now increased by 300 lb. per hour—not in

itself a large amount. If the charge for steam is calculated at 7s. 6d. per 1,000 lbs.—it might have had to be raised on solid fuel boilers—and the saving taken over 24 hours, this increase is equivalent in value to £2 14s. per day. The total cost of implementing these ideas (lagging, cover plates, etc.) amounted to £75.

With the experience gained on the No. 2 boiler, attention was turned to No. 1 (which is served by gases from 16 retorts. Here, however, the problem was somewhat different since no tubes were plugged off, and it would appear that benefit could not be derived from any increase in outlet gas temperatures by repeating our previous alterations. In discussing this matter with our colleagues in the contracting business, we were introduced to the 'spiral retarder.' Unfortunately we have not yet had an opportunity of trying these out in practice, but we are assured that by reducing the velocity of the gases through the tubes and by increasing turbulence we shall benefit in a lower gas outlet and higher evaporation.

From the work carried out at Chelmsford, the following conclusions were come to:

1. A fuel saving of 1% on producers with an annual coal usage of 1,000 tons, means the equivalent of 1,000 therms on gas made.
2. If it is possible to shut down solid fuel boilers by making waste heat boilers more efficient, then the saving in wages and solid fuel is considerable. The smaller savings mount up eventually to formidable totals, for example, boiler cleaning, maintenance, lighting, the gas used for boilermen's meals and tea brewing.
3. How much money is running down the drain as condensate or how much good quality coke being crushed to low price breeze by vehicles under the coke plant.

So often it has been said that we are scraping the bottom of the barrel in gas manufacture, but how near the bottom are we?

GAS ON THE CONTINENT

New methods of drying petroleum gases

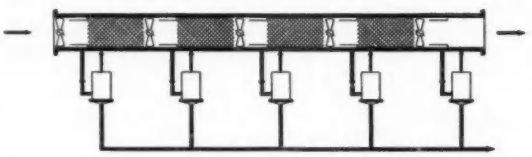
PETROLEUM gases can rarely be used at the point of production and often require to be transported long distances and hence require careful drying and cleaning. The extent and method of this treatment depend often on the pressure and composition of the gas at the well; certain constituents can be highly corrosive. This article describes new processes for carrying out such purification. The first type of apparatus which is considered is a high-pressure centrifuge with a photo-electric level control.

The unit comprises a vertical pressure vessel with a central tube through which the gas from the well enters, the top portion of the vessel containing vanes to produce the required swirl, the lower portion being a sump for the liquid. The simple internal parts are little impaired by solids in the gas. The level of the sump is controlled by a photo-electric cell monitoring a level gauge and controlling a diaphragm-operated valve. The period of draining the sump can be set by an adjustable timer to suit the pressure; the number of times that the valve is opened can be counted to give a measure of the liquid removed.

Problem of dew-point control

A less expensive liquid separator consists of a rotating impeller followed by a nest of mesh or gauze, mounted directly in the duct. In order to facilitate maintenance, it is best to erect one or more such units in a flanged portion of duct. In the event of a breakdown the whole portion of duct is removed, thus reducing the number of flanges in the system. The system is shown in the diagram, from which it can be seen that each section of the separator is provided with collector vanes and a liquid trap. When the impellers are correctly designed to suit the pressure and type of liquid to be collected, an efficiency of 80% per section can be achieved. Of equal importance as the removal of solids and liquids at the well-head, is the problem of dew-point control. When the dew point is high, but the gas is only being sent a short distance, it may be sufficient to heat the gas.

Under normal conditions a careful drying of the gas is essential. This can be done in two main ways, either by cooling or by artificial drying agents such as silica gel or



A four-stage centrifuge and mesh separator with liquid traps.

aluminium oxide or liquids such as di- or triethylene glycol. The cooling can clearly be done by an external refrigerator circuit or by making the gas expand in such a way as to cool itself; in both cases a counter-flow heat exchanger is necessary. Clearly, if a large pressure drop is available self-cooling should be used. In general, it should not be necessary to reduce the dew point below −15°C., and this can be done economically with ethylene glycol, thus avoiding expensive solid absorbent units. The contact with the glycol can be either in a column which must of course withstand the pressure or by spraying into a duct. The glycol is regenerated in a small distillation plant. Karl Rogge, *Gas-Wärme*, 1959, **8**, 157.

Welding exhibition

MUREX WELDING PROCESSES LTD., are holding an extensive welding exhibition at the works of Specialloid Ltd., Black Bull Street, Leeds 10, from April 5-9, 1960. The display will demonstrate the new Murex automatic welding equipments and the latest Murex hand-welding electrodes and equipments. A comprehensive range of Ross positioning and holding equipment is also being shown. The exhibition will be open at the following times: April 5-8, 10 a.m. to 12.30 p.m.; 2.30 p.m. to 6.30 p.m. There will be special evening sessions on Tuesday and Thursday until 8 p.m. April 9, 10 a.m. to 12.30 p.m.

B.C.R.A. find simple way to remove oil from effluent

NEWS SUPPLEMENT

THE British Coke Research Association have developed a method for reducing the oil content of emulsified waste liquids to trace amounts of the order of one to five mg. per litre. The method uses cheap, readily available materials such as fine coal or coke which do not require specialised treatment or preparation.

Wastes containing between 20 and 2,000 mg. of oil per litre are treated in what is basically a two stage process.

Stage 1 is particularly effective with wastes containing more than 200 mg. of oil per litre and where oil is floating on the surface.

Stage 2 is especially applicable where the initial oil content is 100 mg. per litre or less, such emulsions having been found to be the more difficult to treat. In this context, oil refers to non-volatile matter extractable by light petroleum.

This method of oil removal will be of particular value to the coking industry and may well have useful applications in other industries with similar problems of oily effluents.

It should be emphasised that any method of treatment, however good in itself, must be considered and possibly modified in relation to local conditions which may complicate what superficially appears to be a straightforward solution to the problem.

260 GAS WORKERS IN ONE-DAY STRIKE —NEW MOVE TODAY

ABOUT 260 maintenance men went on unofficial strike at various North Thames Gas Board works on Monday. They went back yesterday, but it was anticipated that other key workers would come out today—how many, and in what works was not known at time of going to press.

Shop stewards told the management that one-day token strikes would be held during the next two weeks in support of the maintenance men's claim for higher pay and shorter hours.

Mr. J. Matthews, who represents the National Union of General and Municipal Workers on the executive of the Confederation of Shipbuilding and Engineering Unions, has alleged that these threatened stoppages were part of a shop stewards' plot to disrupt the gas, electricity, port and motor industries in the next two or three weeks and to bring about major unofficial stoppages on or by April 8.

Drain on Stirling

Employees of the Scottish Gas Board arrived at the Thistle Street, Stirling, showroom recently to find that safe-blowers had taken £200.

Let's see your money, Board Chairman tells industrialists

'WE hope to see the colour of your money,' said Dr. R. S. Edwards, Chairman of the North Eastern Gas Board, in an unusually hard-selling speech to industrialists at the opening of the Gas at Work in Industry Exhibition at Harrogate on Monday. 'This is a business exhibition with a down-to-earth approach. We are ready and anxious to show you how to meet your heating requirements with gas.'

Emphasis of exhibition

Dr. Edwards pointed out that the emphasis of the exhibition was on the live operation of plant developed during the last few years, much of it closely connected with industries peculiar to the areas of the two Boards sponsoring the exhibition, the Northern and the North Eastern.

The opening ceremony was performed by Sir William Scott, O.B.E., Managing Director of Armstrong Whitworth (Metal Industries) Ltd. and Jarrow Metal Industries Ltd., who, speaking as an engineer, took the view that exhibitions of this kind must be regarded as a means of education. They were in fact 'temporary universities of learning,' and he hoped that the exhibition would fulfil its main object of bringing technical knowledge of the service which gas could offer to all who visited it.

Stress relieving

Sir William emphasised the importance of the exhibition at a time when there was fierce competition throughout the world, because anything which contributed to the keeping down of costs of production and increasing efficiency must be welcomed. He made particular mention of the exhibit on stress relieving, which constituted one of the biggest problems encountered in modern methods of fabrication, and to hot rolling. He referred also to the part which gas had to play in putting into effect the Clean Air Act, legislation which they were all anxious to support but which often presented difficulties.

Sir William quoted the promising prospects for the gas industry described recently by Mr. Richard Wood, the Minister of Power. 'Such developments offer a challenge not only to the gas industry itself but to industry as a whole,' he commented, and went on to speak of the relationship between gas and coal.' 'These modern developments of yours could not come at a more convenient time for coal,' he said. 'The N.C.B. needs all the help it can get.'

Finally, he congratulated the two Board Chairmen on their courage and foresight in staging the exhibition in the north. 'And I would also like to congratulate the people a little lower down who must have worked like hell,' he added.

Sir William also spoke at the luncheon which preceded the opening ceremony when he responded to the toast of 'The Guests,' proposed by Sir Henry Jones, Chairman of the Gas Council.

Capsule forecast

Sir Henry delivered his usual capsule forecast of the gas industry of the future and gave an assurance that they would keep the supply of gas in step with the requirements of its consumers; to this end they were all working as a team.

He referred briefly, but sharply, to counties like Yorkshire where the local authorities did not always seem to realise that if they did not allow their tenants freedom of choice and denied them gas in their homes they were in fact restricting the development of a public service and thereby making it more difficult for the gas boards to offer gas to industry at the most favourable price.

In a reference to the importance of industrial gas sales to the two Boards concerned in the exhibition—the Northern Board sell one-third of their gas to industry and the North Eastern Board 30%—Sir Henry outlined some of the uses to which this versatile fuel could be put and stressed the high quality of service and the technical development which backed it up.

The exhibition is held in the New Exhibition Hall.

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C23,

Mr. Melvin talks to Wales and Western Juniors

The big and exciting job of the gas industry's engineers and salesmen

'WE all know that the days have long gone when, if we made and distributed gas, sales would more or less look after themselves. We are constantly being told that we must also be specialists in utilisation; that we must all be salesmen.' Mr. D. D. Melvin, President of the Institution of Gas Engineers, said this when he addressed a joint meeting of the Wales and Monmouthshire and the Western Junior Gas Association at Newport last week.

Astonishing changes

'We are at the moment planning the programme for our next annual general meeting in Edinburgh this summer. I do not wish to anticipate our proceedings, but I can tell you that, in my view, they will certainly reflect the astonishing changes which the industry is undergoing, and indicate some of the new prospects opening up before it,' he added.

The Institution and the Junior Gas Associations were fundamentally concerned with technical matters.

'We are specialists. But no profession these days can afford to be concerned only with its technical preoccupations. It must see them in the widest possible context,' said Mr. Melvin.

'While we are all naturally and, perhaps, primarily interested in new techniques such as high-pressure gasification processes as they affect production and distribution, we must also give detailed thought to their long-term effect on the whole structure of the industry.

'We must think not only of what our industry is becoming in terms of plant and machinery, but in terms of people. What kind of man is the new-age gasman?

Types of gasmen

'Ever since nationalisation every area board has had to see to the integration of its technical resources. And I would suggest to you that another and more complex kind of integration is occurring, which will have an effect not only on what kind of gasworks we have in the future but what types of gasmen.

'It is important that we should be aware of this process taking place, and not let ourselves be haphazardly driven along by it or allow ourselves to become so absorbed in our particular job that we fail to see new possibilities whenever they may arise.'

The gas industry needed the best of talents represented by engineers and salesmen, Mr. Melvin went on. It was true that each had their own specialist techniques and it was rare to find these combined in one individual.

'Both must share in the conviction that the gas industry of the second half of the 20th century has as big and as exciting a job to do as ever came the way of the previous generations engaged in it,' he said.

In order to foster this conviction it was essential that specialists should be fully informed of all major developments and that they should meet to get to know each other's problems and possibilities and form an understanding of the nature of the industry as a whole.

This was where the junior associations came in, he said.

The meeting was also addressed by Mr. R. S. Hayman, Industrial Gas Officer to the Gas Council, who maintained that selling industrial gas was a little different from selling other forms of gas. The staff had to be fuel technologists capable of talking almost in the same breath to the general manager or managing director of a company and the works foreman. They had to be able to talk on even terms with consumers of vast quantities of gas and those who took only a very small supply.

Unique organisation

'The industrial gas engineer has to be knowledgeable on so many occasions. You can only prove the worth of gas by knowing what you are talking about,' Mr. Hayman added.

The British gas industry had a unique, closely-knit organisation which could speak with one voice, and help and experience could be passed from one board to another in a different part of the country. This was a two-way traffic and it was happening all the time.

The problems of selling industrial gas varied widely from district to district, but economics were not the most important thing. Gas was not sold on price. It was sold because it could do the job better than other fuels and so result in increased outputs and more efficient working.

Constant competition

But once a plant had been put in on gas it was subject to constant competition. There was always someone trying to seduce the management to change his fuel.

'We have got continually to give a service to retain the confidence of the consumer,' he said.

APPLIANCE-TEST COUNCIL PUBLISH PROCEDURE

THE Domestic Solid Fuel Appliances Approval Council assume responsibility for the testing of domestic solid fuel appliances from April 1. An agreed code of procedure deals with the approval, procedure, and conditions for submission of appliances, and incorporates an appendix which summarises the methods of test and required standards of performance. Approval is based on British Standards Institution Specifications.

The code is available from 1, Grosvenor Place, London, S.W.1.

RADIATION TO OPEN SCOTTISH FACTORY

RADIATION LTD., are to establish a new factory in Peterhead. This was announced at a Press conference held at the Glasgow office of the North of Scotland Hydro-Electric Board, presided over by Lord Strathclyde, Chairman of the Board, and attended by Mr. W. Donald King, M.C., Chairman of Radiation Ltd.

Ease unemployment

The factory will be built by Scottish Industrial Estates and should be ready in about six months' time. The new plant is initially intended for the assembly of electric cookers and water heaters for the Scottish market. Radiation may employ about 100 workers, which should ease the serious unemployment position in Peterhead.

It is hoped that the Peterhead plant will eventually extend its activities to other products manufactured and marketed by the Radiation Group, which include New World gas cookers, fires and water heaters, Ascot and Ewart gas water heaters, Ductair central heating equipment, and Parkray solid fuel fires and boilers.

Change of address

Central Laboratories, Mersey Group, have a new address as follows: North Western Gas Board, Mersey Group, Central Laboratories, Hind Street, Birkenhead, Cheshire (Birkenhead 8481).

No further communications for chemical or instrument departments should be sent to Wavertee or Radiant House.

PERSONAL NOTES

MR. R. T. REDFERN, Vice-Chairman and Managing Director of the Bryan Donkin Co. Ltd., Chesterfield, retires this week after 23 years with the company. He will be succeeded by MR. S. FARRER. Before joining the company in 1937, Mr. Redfern, having been indentured as a mechanical engineering apprentice, studied engineering at Sheffield University, and was for 20 years a part-time lecturer, first with the Chesterfield higher education committee, and then with the College of Technology from its inception. He is now a member of its governing body. His career with the Bryan Donkin Company has covered a wide range of activities. From 1937 to 1940, he was chief draughtsman, then works manager until 1947, and general manager from 1947 to 1951. He was appointed a director in 1949, and Managing Director in 1951. He has also been a director of B.H.D. Engineers Ltd., British Furnaces, and George Wallers (Stroud). Mr. Redfern is a member of the Institute of Mechanical Engineers and a member of the Institution of Gas Engineers.

MR. H. WADSWORTH, Tottenham Divisional Engineer, will be divisional engineer for both the Tottenham and Watford Divisions of the Eastern Gas Board from July 1. His responsibilities will be gas production and transport in the two divisions and the operation and commercial activities of the Board's chemical works at Leeside, Tottenham. MR. P. WEDGWOOD, who was production engineer, Watford Division, has been appointed Chief Chemist to the Board and will take up his duties at Sun Building under MR. E. O. ROSE, Chief Engineer, as soon as this can be arranged. His appointment was from February 1. He will be replaced as divisional production engineer by MR. H. C. DUNBAR, at present Works Engineer at St. Albans, in the near future. His office will be at Radiant House and he will be responsible to Mr. Wadsworth. These appointments derive from the impending retirement of MR. W. A. EVETTS, Watford Divisional Engineer, who has served the gas industry at Watford for 40 years.

MR. W. K. HUTCHISON, C.B.E., Deputy Chairman of the Gas Council, has been appointed a Member of the Minister of Power's Scientific Advisory Council in succession to SIR HENRY JONES, M.B.E., who has retired from the appointment following his elevation to the Chairmanship of the Gas Council.

MR. G. E. BLUNDELL, Assistant Materials Handling, Transport and Coal Manager of the Southern Gas Board, has been elected as Associate Member of the Institution of Mechanical Engineers.

MR. J. E. WHITE has been re-appointed Deputy Chairman of the Northern Gas Board.

'LEAN YEARS' IN DOMESTIC USAGE A PHASE, SAYS DIVISIONAL CHIEF

EVER since the birth of the electrical industry, many had forecast the doom of the gas industry, said Mr. W. Nicol Baird, General Manager, Central Division, Scottish Gas Board, in an address at St. Andrews. Those who had more intimate knowledge of the subject had entirely different ideas.

Miss Hilda Swindells, M.B.E., Chief Home Service Adviser to the North Western Gas Board, pictured outside Buckingham Palace after her investiture by the Queen Mother on March 22.

'We are, however,' said Mr. Baird, 'quite conscious of the fact that the gas industry will pass through some lean years before new developments can reverse the adverse trend.'

Influencing the situation were the rapid replacement of gas street lights by electricity, and a monopoly by electricity of the housing policies of some local authorities.

Also, new appliances were so much more efficient than those produced two or three years ago, that they used some 40% less gas for the same performance. Income from residual products had deteriorated considerably.

It was not altogether a bad thing, however, for any industry to find itself up against severe competition. The gas industry, thus threatened, had already found a multiplicity of cheaper production sources.

Few consumer goods processes nowadays did not involve some use of gas. For example, some of the biggest gas-users were the manufacturers of electric bulbs and television tubes.

In several thousand other industrial processes gas was essential for the cheap production of commodities in large quantities. The demand for gas for industrial purposes increased every year and the decline in domestic consumption was only a temporary phase.

FORTHCOMING EVENTS

March 31.—NORTH THAMES G.C.C.: City Hall, Westminster. Council Meeting.

April 2.—MANCHESTER JUNIORS: Visit to Garston works, followed by a paper on 'Some Applications of Statistics to the Gas Industry,' by H. Crompton. 2.15 p.m.

April 4.—SOCIETY OF ENGINEERS: The Geological Society, Burlington House, W.1. 'Research Testing,' by A. E. Bingham. 5 p.m.

April 6.—YORKSHIRE JUNIORS: Chesterfield. Visit to Staveley Iron & Chemical Co. Ltd.

April 6.—WALES AND MONMOUTHSHIRE JUNIORS, NORTH WALES SECTION: Llandudno. 'Training Matters,' by B. Wilson. 3.0 p.m.

April 7.—NORTH OF ENGLAND SECTION, I.G.E.: 'Modern Trends in Gas Purification,' by J. J. Priestley and W. E. Bouch. 2.30 p.m.

April 8.—WALES G.C.C.: Town Hall, Aberystwyth. Council Meeting. 11 a.m.

April 8. — LONDON AND SOUTHERN JUNIORS: Westminster Technical College, Vincent Square, S.W.1. 'Quality and Cost Control on the District,' by G. H. Clegg. 6.30 p.m.

April 8.—COKE OVEN MANAGERS' ASSOCIATION, SOUTHERN SECTION: Park Hotel, Park Place, Cardiff. 'Manufacture of Di-Ammonium Phosphate,' by L. W. Stubbs.

April 9.—EAST OF SCOTLAND JUNIORS: Aberdeen. "Gas Production,' by J. Scott.

April 13.—INSTITUTION OF PLANT ENGINEERS: Taypark Hotel, West Ferry, Dundee. 'Types and Uses of Eutectic Welding Alloys for Engineering Purposes.' 7.30 p.m.

S.B.G.I. GOLF

The summer meeting of the S.B.G.I. Golfing Circle will be held on the Bruntsfield links, Edinburgh, on Monday, May 30 next to coincide with the Annual General Meeting of the Institution of Gas Engineers. Further details may be obtained from: Mr. C. T. C. Woodall, Hon. Secretary, S.B.G.I. Golfing Circle, 255, North Circular Road, Neasden, N.W.10. Telephone: Willesden 1234.